DOCUMENT RESUME

ED 407 661 CS 012 819

AUTHOR Kirby, John R.; And Others
TITLE Causal Path Analysis of Processes Affecting Early Reading.
PUB DATE 11 Aug 96
NOTE 10p.; Paper presented at the Annual Meeting of the American Psychological Association (104th, Toronto, Canada, August 9-13, 1996).
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Beginning Reading; Foreign Countries; Kindergarten Children; Longitudinal Studies; Models; *Phonology; Predictor Variables; Primary Education; Reading Ability; *Reading Processes; Reading Research; *Reading Strategies
IDENTIFIERS Causal Analysis

ABSTRACT

A 2-year longitudinal study investigated the causal contributions of phonological processing to early reading competency. Subjects, 161 kindergarten children, were tested with a battery of measures assessing letter knowledge, reading ability, and 5 phonological constructs: rapid naming ability, rhyming ability, phonological memory (successive processing), phonological synthesis (blending), and phonological analysis. Of the subjects, 122 were administered measures of reading ability one year later in grade 1. Results indicated (1) the most successful model showed naming and memory abilities contributing toward the acquisition of letter knowledge and the development of rhyming ability, which in turn supported synthesis, which then contributed to analysis which had the only significant effect upon reading; (2) phonological analysis was the most salient predictor of grade 1 reading; and (3) the causal path was more plausibly from analysis to reading than from reading to analysis. Findings support two conclusions: phonological analysis is the most powerful cognitive variable determining early reading competency; and phonological analysis depends in turn upon earlier developing skills, including phonological synthesis, letter knowledge, and naming, memory, and rhyming abilities. (Four figures and three tables of data are attached.) (RS)

Causal Path Analysis of Processes Affecting Early Reading

(American Psychological Association, Toronto, 11 August 1996)

John R. Kirby, Rhonda Martinussen, and Philippa Beggs
Faculty of Education, Queen's University
Kingston, Ontario, Canada

This paper reports the results of a 2-year longitudinal study investigating the causal contributions of phonological processing to early reading competency. 161 kindergarten children subjects were tested with a battery of measures assessing letter knowledge, reading ability, and five phonological constructs: rapid naming ability, rhyming ability, phonological memory (successive processing), phonological synthesis (blending), and phonological analysis. 122 of these subjects were readministered measures of reading ability one year later in Grade 1.

Results

Confirmatory factor analysis and structural equation modelling were employed to investigate a number of possible theory-based models of phonological processing and reading in the kindergarten and Grade 1 data separately. In kindergarten, the most successful model showed naming and memory abilities contributing toward the acquisition of letter knowledge and the development of rhyming ability, which in turn supported synthesis, which then contributed to analysis which had the only significant effect upon reading. In the Grade 1 data, the most successful model followed the same general structure, with fewer significant paths for naming, memory, and rhyming abilities.

The kindergarten data were then used to predict Grade 1 reading ability, in both structural equation modelling and regression analysis. These results indicated that phonological analysis was the most salient predictor of Grade 1 reading, and that the causal path was more plausibly from analysis to reading than from reading to analysis.

Implications and Conclusions

This study adds support to two conclusions: (a) phonological analysis is the most powerful cognitive variable determining early reading competency, and (b) phonological analysis depends in turn upon earlier developing skills, including phonological synthesis, letter knowledge, and naming, memory, and rhyming abilities. These findings have implications for early screening, diagnostic assessment, and instruction. They suggest that

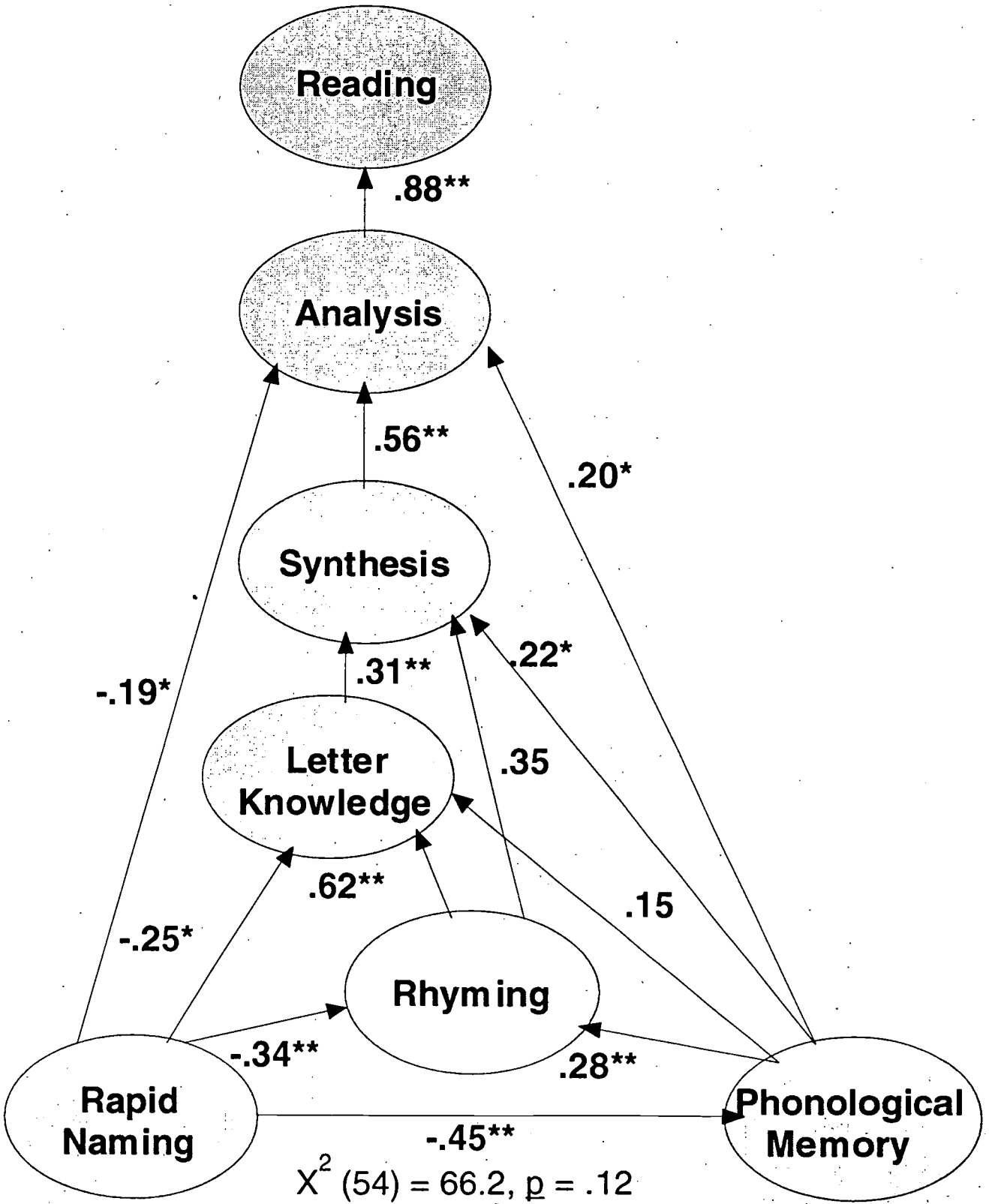
[1]This research was supported by a grant from the Social Sciences and Humanities Research Council of Canada to John R. Kirby and J.P. Das. We thank J.P. Das, J.A. Naglieri, and R. Wagner for making tests available. Address requests for a complete paper to John R. Kirby, Education, Queen's University, Kingston, Ontario, K7L 3N6.

early assessment and intervention may help to eliminate many reading difficulties. Furthermore, because children with severe reading difficulties may have deficiencies in many of the components of phonological processing, phonological intervention may have to be quite broadly based.

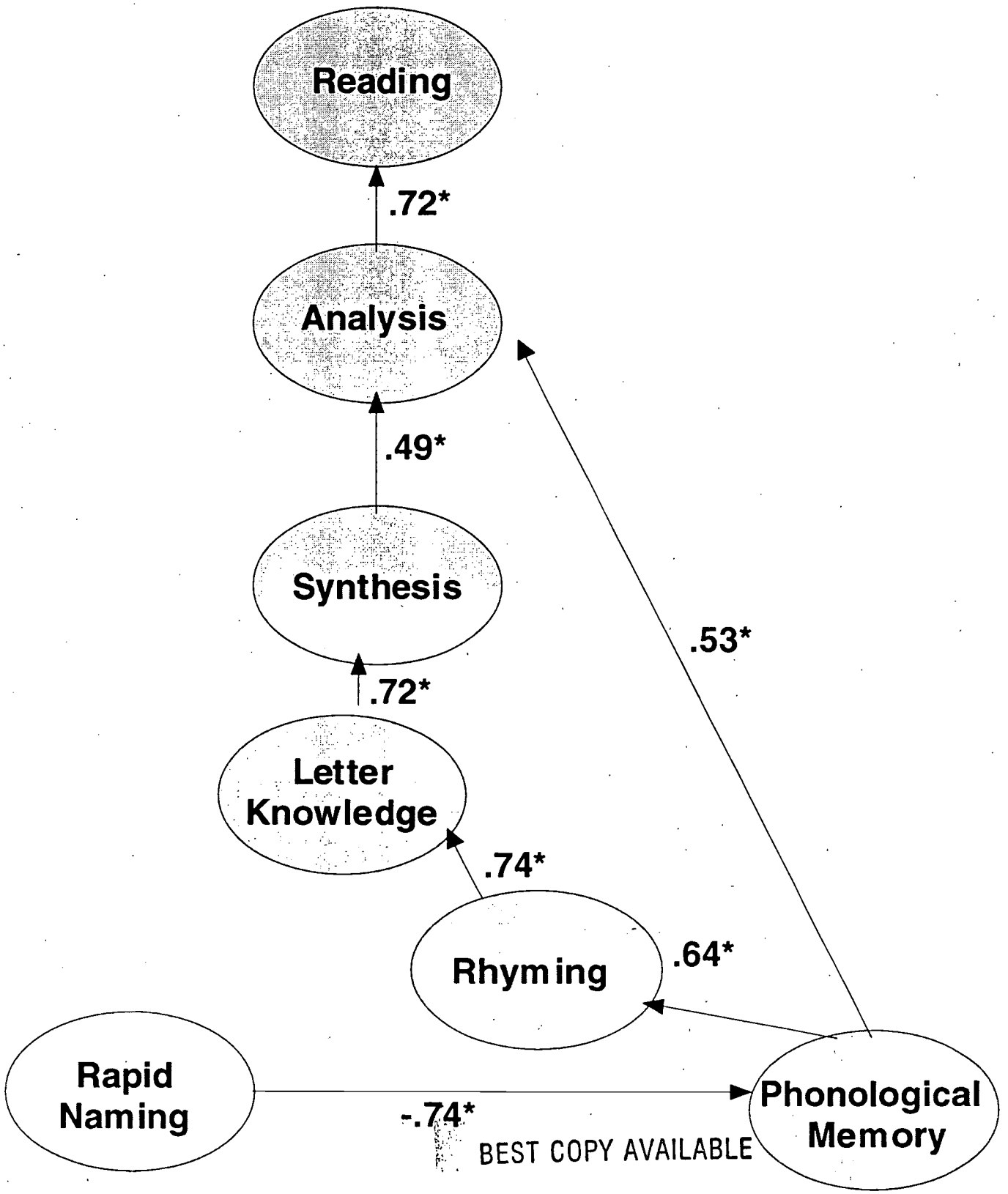
Construct	Measures
Successive Processing	*Word Series* (Das & Naglieri, 1994) Serial recall of lists of words of increasing length. *Sentence Repetition/Questions* (Das & Naglieri, 1994) Recall of and answering questions about nonsense sentences.
Phonological Analysis	*Phoneme Elision* (Torgesen, Wagner, & Rashotte, 1994) Pronunciation of a word after deletion of indicated phoneme. *Sound Isolation* (Torgesen et al., 1994) Identification of initial, middle, or final sound in a given word.
Phonological Synthesis	*Blending Onset and Rime* (Torgesen et al., 1994) Pronunciation of words when given component onsets and rimes. *Blending Phonemes* (Torgesen et al., 1994) Pronunciation of words when given component phonemes.
Rhyming	*Nursery Rhyme Knowledge* (adapted from Maclean et al., 1987) Recitation of all or part of 4 common rhymes. *Rhyme Production* (Maclean et al., 1987) Production of a rhyming word or non-word in response to a given word. *Rhyme Oddity* (Bradley & Bryant, 1985). (Grade 1 only)

Rapid Naming	*Color Naming* (Wolf, Bally, & Morris, 1986). Timed naming of a sequence of colors. *Picture Naming* (Wolf et al., 1986) Timed naming of a sequence of pictures.
Letter Knowledge	*Letter Names* (Clay, 1992). Naming of upper and lower case letters presented in random order. *Letter Sound* (Clay, 1992). Production of correct sounds for letters presented in upper case in random order. (Grade 1 only).
Reading	*Word Attack* (Woodcock, 1987) Pronunciation of pseudowords. *Word Identification* (Woodcock, 1987) Pronunciation of words shown without context.

Kindergarten Structural Model

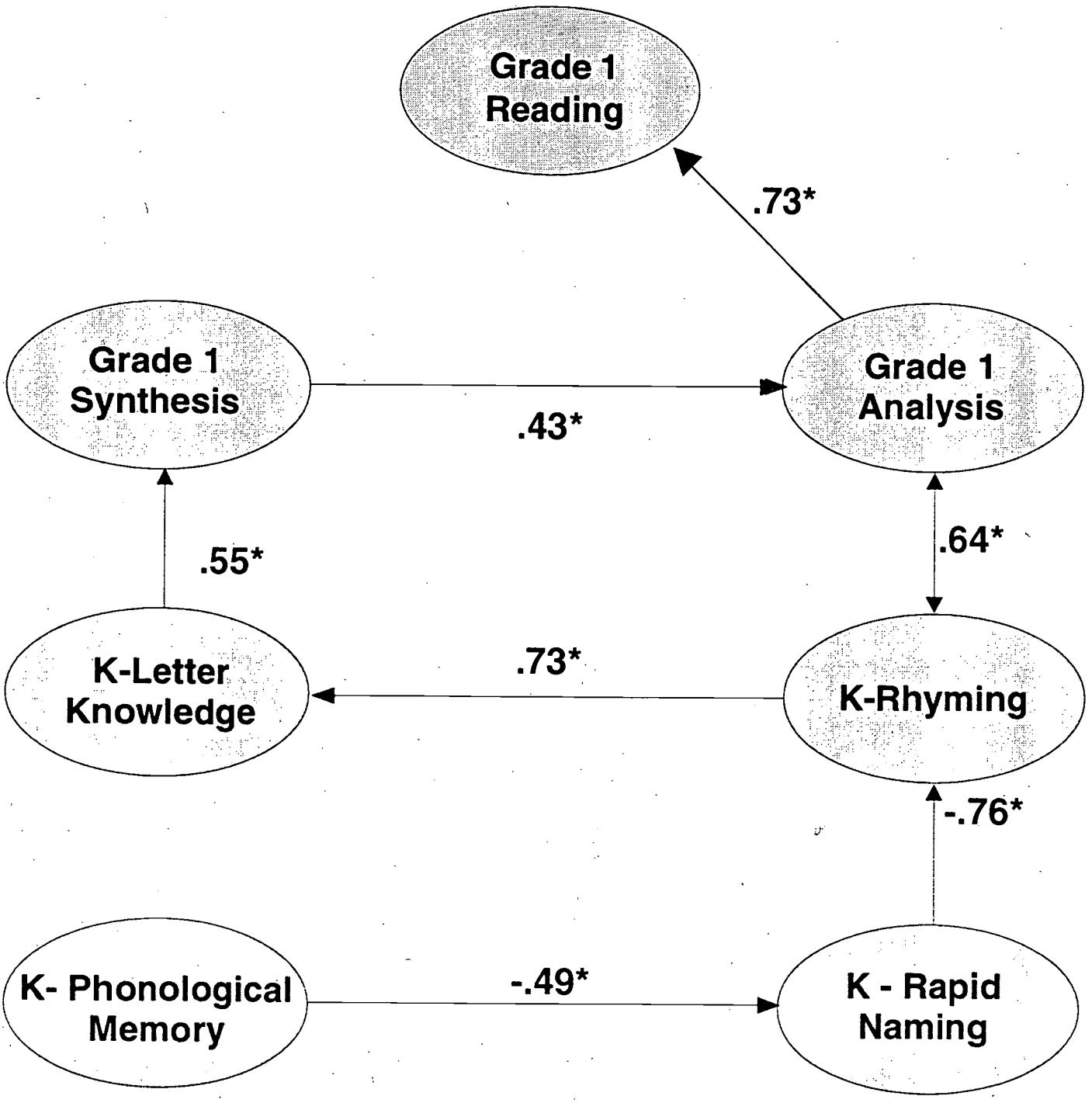


Grade 1 Structural Model



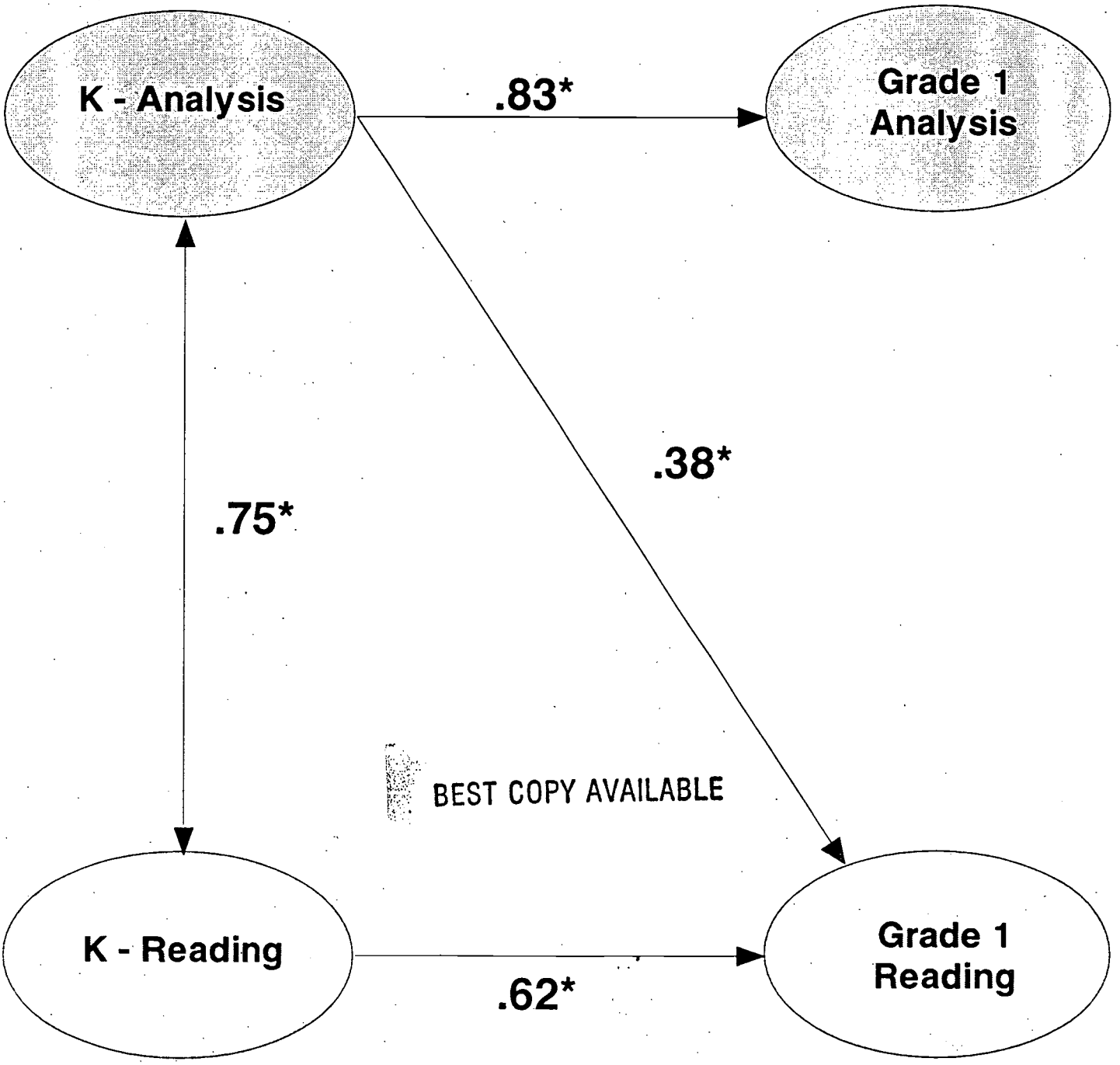
X^2 (80) = 140.26 p =.001
CFI = .96

Kindergarten- Grade 1 Structural Model



X^2 (59) = 75.76, p = .07
CFI = .98

Analysis and Reading (K to 1)



x^2 (11) = 31.1, p = .001
CFI = .98

Summary of Regression Analyses

Predicting Grade 1 Reading from Kindergarten Phonological Measures

Dependent variable: **Grade 1 Word Identification**

$R^2 = .60, p < .0001$

Predictor	Standardized coefficient	p
Phoneme Elision (Analysis)	.34	.0001
Sound Isolation (Analysis)	.26	.006
Blending Phonemes (Synthesis)	.19	.03
Picture Naming (Naming)	-.17	.008

Dependent variable: **Grade 1 Word Attack**

$R^2 = .48, p < .0001$

Predictor	Standardized coefficient	p
Phoneme Elision (Analysis)	.25	.016
Sound Isolation (Analysis)	.41	< .0001
Sentence Repetition (Memory)	.15	.08

Correlations between phonological analysis and reading measures in kindergarten and Grade 1 (n = 122).

	Kindergarten Phoneme Elision	Kindergarten Sound Isolation	Kindergarten Word ID	Kindergarten Word Attack
Grade 1 Phoneme Elision	.63	.60	.52	.43
Grade 1 Sound Isolation	.54	.60	.46	.37
Grade 1 Word Identification	.69	.68	.90	.77
Grade 1 Word Attack	.61	.64	.83	.84

CS012819

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
Educational Resources Information Center (ERIC)

REPRODUCTION RELEASE

(Specific Document)

I. DOCUMENT IDENTIFICATION:

Title: CAUSAL PATH ANALYSIS OF PROCESSES AFFECTING EARLY READING	
Author(s): KIRBY, J.R., MARTINUSSEN, R., & BEGGS, P.	
Corporate Source:	Publication Date: 11 AUGUST 1996

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, *Resources in Education* (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic/optical media, and sold through the ERIC Document Reproduction Service (EDRS) or other ERIC vendors. Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce and disseminate the identified document, please CHECK ONE of the following two options and sign at the bottom of the page.

☑ Check here
For Level 1 Release:
Permitting reproduction in microfiche (4" x 6" film) or other ERIC archival media (e.g., electronic or optical) *and* paper copy.

The sample sticker shown below will be affixed to all Level 1 documents

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

Sample

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

Level 1

The sample sticker shown below will be affixed to all Level 2 documents

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN OTHER THAN PAPER COPY HAS BEEN GRANTED BY

Sample

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

Level 2

☐ Check here
For Level 2 Release:
Permitting reproduction in microfiche (4" x 6" film) or other ERIC archival media (e.g., electronic or optical), but *not* in paper copy.

Documents will be processed as indicated provided reproduction quality permits. If permission to reproduce is granted, but neither box is checked, documents will be processed at **Level 1**.

"I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce and disseminate this document as indicated above. Reproduction from the ERIC microfiche or electronic/optical media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries."

Sign here→ please

Signature:	Printed Name/Position/Title: JOHN R. KIRBY	
Organization/Address: FACULTY OF EDUCATION, QUEEN'S UNIVERSITY, KINGSTON, CANADA K7L 3N6	Telephone: 613-545-6218	FAX: 613-545-6584
	E-Mail Address: KIRBYJ@EDUC.QUEENSU.CA	Date: 3/1/97

ERIC/CASS

COUNSELING
and
STUDENT SERVICES
CLEARINGHOUSE

School of Education
101 Park Building
University
of
North Carolina
at Greensboro
Greensboro, NC
27412-5001

Toll-free: (800)414-9769
Phone: (910) 334-4114
Fax: (910) 334-4116
INTERNET:
ERICCASS@IRIS.UNCG.EDU

Garry R. Walz, Ph.D., NCC
Director
Jeanne Bleuer, Ph.D., NCC
Associate Director

Improving
Decision Making
Through
Increased Access
to Information

November 11, 1996

Dear 1996 APA Presenter:

The ERIC Clearinghouse on Counseling and Student Services invites you to contribute to the ERIC database by providing us with a written copy of the presentation you made at the American Psychological Association's 104th Annual Convention in Toronto August 9-13, 1996. Papers presented at professional conferences represent a significant source of educational material for the ERIC system. We don't charge a fee for adding a document to the ERIC database, and authors keep the copyrights.

As you may know, ERIC is the largest and most searched education database in the world. Documents accepted by ERIC appear in the abstract journal Resources in Education (RIE) and are announced to several thousand organizations. The inclusion of your work makes it readily available to other researchers, counselors, and educators; provides a permanent archive; and enhances the quality of RIE. Your contribution will be accessible through the printed and electronic versions of RIE, through microfiche collections that are housed at libraries around the country and the world, and through the ERIC Document Reproduction Service (EDRS). By contributing your document to the ERIC system, you participate in building an international resource for educational information. In addition, your paper may listed for publication credit on your academic vita.

To submit your document to ERIC/CASS for review and possible inclusion in the ERIC database, please send the following to the address on letterhead:

(1) Two (2) laser-print copies of the paper,
(2) A signed reproduction release form (see back of letter), and
(3) A 200-word abstract (optional)

Documents are reviewed for contribution to education, timeliness, relevance, methodology, effectiveness of presentation, and reproduction quality. Previously published materials in copyrighted journals or books are not usually accepted because of Copyright Law, but authors may later publish documents which have been acquired by ERIC. Finally, please feel free to copy the reproduction release for future or additional submissions.

Sincerely,

Jillian Barr Joncas

Jillian Barr Joncas
Acquisitions and Outreach Coordinator